United States
Department of
Agriculture

Forest
Service

**Southwestern
Region**

# Forest Pest Management Report

3420
R-3-95-1 (Revised)

POST-TREATMENT BIOLOGICAL EVALUATION
OF THE 1981
TUSAYAN DWARF MISTLETOE (DM) CONTROL PROJECT

February 1995

By

Mary Lou Fairweather

3420
R-3-95-1

# POST-TREATMENT BIOLOGICAL EVALUATION OF THE 1981 TUSAYAN DWARF MISTLETOE (DM) CONTROL PROJECT

FEBRUARY 1995

By

Mary Lou Fairweather

USDA Forest Service, Southwestern Region
State and Private Forestry
Entomology and Pathology
517 Gold Avenue, SW
Albuquerque, New Mexico 87102

Table of Contents

# ABSTRACT

The effectiveness of the 1981 Tusayan dwarf mistletoe control project is evaluated. During the project, hundreds of trees were girdled and poisoned to kill DM infected trees and prevent spread of the disease. A strip survey from 1993 reveals that 98 percent of the treated trees are dead. Ninety-five percent of the killed trees fell over, leaving only 5 percent remaining standing as snags. It is apparent that the dead standing trees are some of the largest of the treated trees. DM infection levels of two of the stands calculated from stand exam data is low. This coincides with the small amount of DM infection observed across all sites during the strip survey of the snag analysis.


# INTRODUCTION

Dwarf mistletoes are the most prevalent disease causing agents in Southwestern forests. On the Kaibab National Forest (NF), Hessburg and Beatty (1985) found approximately 34 percent of the commercial acres of ponderosa pine to be infected by southwestern dwarf mistletoe (SWDM). Incidence is believed to have increased in the past 30 years since Andrews and Daniels (1960) reported the pathogen present on 30 percent of the surveyed area. Although the basics of dwarf mistletoe control have been known for a long time (Koristian and Long 1922, Pearson 1950), past practices such as fire suppression and selective harvesting may have exacerbated SWDM infection in southwestern ponderosa pine stands (Maffei and Beatty 1988).

One approach to managing DM disease is to remove DM infected overstory trees in order to protect the developing understory from becoming infected. In the time period from about the mid-60's until the late 1980's, prescriptions for this technique typically called for the removal of all overstory trees, infected and uninfected. This approach, in combination with the removal of existing snags by woodcutters left many areas of the Forest deficient in snags for use by cavity nesting species of birds and other wildlife species. So in the 1970's, foresters and researchers began developing techniques to create snags from live trees which would remain standing long enough to provide some quality habitat for cavity nesters. The 1981 Tusayan DM control project was designed for this purpose; It was designed to kill dwarf mistletoe infected trees in order to provide habitat for cavity nesting birds and other wildlife species.

The Tusayan project took place in sections of the Mistletoe Timber Sale which had been harvested from 1967 to 1969. During the timber sale, overstory trees with DM infection were targeted for removal. In 1976, an examination and biological evaluation of the residual stands were completed by Jim Walters, Pathologist, from Forest Pest Management, Region 3. Walters identified four different areas where dwarf mistletoe was considered to be "a management problem" and provided several alternatives for prevention and suppression measures. In 1978, the District submitted a DM suppression project proposal. They requested funds to frill and poison trees greater than 9 inches in diameter at breast height (dbh) and having a DMR of 3 or greater with an arsenic containing herbicide (ACH) over approximately 1,800

acres. The objective was to make snags out of these infected trees since the sale area was deficient in dead standing trees. The project was completed in 1981 and a first-year post-treatment evaluation completed in 1982. The latter revealed that approximately 20 percent of the treated trees were still alive. The purpose of this paper is to report the findings of a 10-year post-treatment evaluation completed in the fall of 1992, and make recommendations for any follow-up treatments.

## OBJECTIVES AND TREATMENTS

Five sites (numbered 3-7) were treated during the Tusayan DM control project. In sites 3, 4, and 7, all visibly DM infected ponderosa pines greater or equal to 9 inches in diameter at breast height (DBH) were frilled and poisoned with an ACH. These sites had been planted several times following the Mistletoe timber sale and the objective for the DM project was to protect the seedlings and saplings from becoming infected.

Sites 5 and 6 were single-storied in structure, composed of advanced polesized trees. In these sites, all ponderosa pine trees with DM infection in more than one-half of their crown and greater than 9 inches DBH were frilled and poisoned with the arsenical herbicide. The objective was to reduce DM infection to an innocuous level in order to minimize growth loss over time.

## ANALYSIS METHODS

The project area was exhaustively surveyed using a 10 percent strip cruise, similar to that used in the one-year post-treatment analysis. Strips 2 chains wide and 20 chains apart were oriented in an east-west direction throughout the project area. A total of 12 strips covered the area. Every ponderosa pine with a diameter of 9 inches or greater within the 2-chain-wide strip was examined and tallied in one of four categories:

1) Treated, dead standing (snag).
2) Treated, dead fallen.
3) Treated, alive.
4) Untreated, infected.

A tally was kept for each site, as divided in the original project proposal (see Figure 1.).

In order to assess at least some of the current levels of dwarf mistletoe infection, stand exam surveys were conducted in sites 4 and 5. Diameter at breast height (DBH) and dwarf mistletoe rating (DMR) (Hawksworth's 6-class system) were recorded for all ponderosa pines located on variable radius plots, using a basal area factor (BAF) of 10. The height of 3 trees

in each diameter class, in each plot, were recorded. A 4x4 chain grid was used between plot centers. Collected data were run through RMSTAND stand exam summary program for a listing of current site conditions.

## SNAG RETENTION SURVEY

The results of the snag tally are shown in Table 1. Of the 533 trees found to be frilled and poisoned, 524 trees were killed by this treatment (98 percent). Four hundred and ninety-seven of the killed trees (or 95 percent) had fallen over and only 27 trees (about 5 percent) remained standing as snags. Although no diameters were recorded, we estimated that the dead standing trees averaged greater than 16 inches DBH.

TABLE 1. Number of treated trees which were still standing (snags), had fallen over, or were still alive. Also number of DM infected trees which had not been treated during the project.

| | TREATED | | | | UNTREATED |
|---|---|---|---|---|---|
| Site # | Snags | Dead Fallen | Still Alive | TOTAL | Infected |
| 3 | 4 | 123 | 1 | 128 | 19 |
| 4 | 3 | 24 | | 27 | 5 |
| 5 | 9 | 109 | | 118 | 13 |
| 6 | 9 | 213 | 7 | 229 | 27 |
| 7 | 2 | 28 | 1 | 31 | 7 |
| TOTALS: | 27 | 497 | 9 | 533 | 71 |

## STAND EXAM RESULTS

The results of the stand exam survey are shown in Table 2. The trees per acre is greater in site 4, but the square feet of basal area per acre (BA) is greater in site 5 compared to site 4. Although dwarf mistletoe infection was not observed on plots in site 4 during the stand exam survey, a few infected trees were observed in between plots in the eastern section of the site. The site average DBH is similar for both sites.

TABLE 2. Site conditions of sites 4 and 5 of the FY 81 Grandview dwarf mistletoe suppression project.

| UNIT | TPA[a] | BA[b] | DMR© | DBH[d] |
|---|---|---|---|---|
| 4 | 298.1 | 63 | 0.0 | 9.1 |
| 5 | 220.8 | 80 | 0.1 | 8.1 |

a: TPA=trees per acre which are greater than 1 inch in diameter at breast height.
b: BA=Square feet basal area per acre.
c: DMR=Site average dwarf mistletoe rating based on Hawksworth's 6-class system.
d: DBH=Site average diameter at breast height.

## DISCUSSION

Girdling and injecting an arsenical into DM infected trees during the Tusayan DM suppression project was successful in killing the trees. However, only 5 percent of the killed trees were still standing at the time of our strip survey. Since post-treatment surveys were performed only at 1 and 10 years, there is no information on when the majority of the snags fell over. There is also no information on wildlife use of the snags, or if trees greater than a certain diameter in size would have made a longer standing snag. However, the survey crew did observe that the standing killed trees were typically protected from the wind and were of larger size (greater than about 16 inches in diameter).

Bull and Partridge (1986) used a similar herbicide and hypohatchet method to kill ponderosa pine trees in Oregon. They also found it to be an effective method of killing trees, but the snags began falling over in about 3 years and 25 percent of the snags were down in 5 years. Bull and Partridge had actually evaluated 6 methods of creating snags: Girdling; topping

with a chainsaw; dynamiting tops, limbing and inoculating with decay fungi; girdling and inoculating; herbicide/hypohatchet; and baiting trees with bark beetle pheromone. They found the most successful method to be topping and limbing a tree with a chainsaw. These snags died immediately; had the lowest rates of fall, and were the most frequently used snags by cavity nesters for foraging and nesting. Removing the top and limbs insured mortality and reduced wind resistance of the snags.

Other researchers (Schmid et. al., 1985; Kimmey, 1955) have evaluated the rate of deterioration of stands of trees killed by catastrophic events such as fire or bark beetle outbreaks. They both found that appreciable deterioration of ponderosa pine did not begin until after the third year. After that, the snags were very susceptible to windthrow.

In reference to DM infection levels, no DM was recorded on plots from the stand examination of site 4 and very little was found on plots in site 5 (stand average DMR is 0.1). This information coincides with information obtained during the snag survey, i.e., 5 DM infected trees were observed on survey lines passing through site 4, and 13 infected trees were observed in site 5. Since pre-treatment data does not include a site average DMR we are not able to make a comparison of pre- and post-treatment conditions. However, the low levels of DM found in the survey indicate that the treatments which took place during the Mistletoe TS and the Tusayan DM control project were successful in controlling DM infection.

The Tusayan DM project area is within the Scott Forest Land Implementation Planning Unit (Scott FLIPU) which is currently being analyzed for possible resource management activities. Given the low levels of infection in the sites examined during this survey, an aggressive approach to DM reduction is not necessary. However, if some areas are targeted for treatment to achieve a resource management objective such as reducing density (to achieve a high growth rate) DM infected trees should be targeted for removal. There are many sites within the Scott FLIPU that were not part of the Tusayan DM project which have moderate to very high levels of infection. Since mortality is occurring in sites with very high levels of DM infection, the task of the interdisciplinary team is to decide over how much of the analysis area they want this deteriorating state to continue (especially for wildlife habitat) or if they want to halt the process in some areas by regenerating some sites.

# *REFERENCES*


Andrews, S.R.; Daniels, J.P. 1960. A survey of dwarf mistletoes in Arizona and New Mexico. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Station Paper 49, 17p.

Bull, E.L.; Partridge, A.D. 1986. Methods of killing trees for use by cavity nesters. Wildl. Soc. Bull 14(2):142-146.

Hawksworth, F.G. 1977. The 6-class dwarf mistletoe rating system. USDA Forest Service, General Technical Report RM-48. 7pp.

Hessburg, P.F. and J.S. Beatty. 1985. Incidence, Severity, and Growth Losses Associated with Ponderosa Pine Dwarf Mistletoe on the Kaibab National Forest, Arizona. USDA Forest Service, Southwestern Region State and Private Forestry, Forest Pest Management Report R-3, 85-12, 25 p.

Kimmey, J.W. 1955. Rate of deterioration of fire-killed timber in California. USDA Forest Service, California Forest and Range Experiment Station, Circular 962, 23 p.

Maffei, H. and J. Beatty. 1988. Changes in the incidence of dwarf mistletoe over 30 years in the Southwest. p.88-90 In: Proceedings of the Thirty-sixth Annual Western International Forest Disease Work Conference. Bart J. van der Kamp, Ed., September 19-23, 1988, Park City, UT: University of British Columbia, Vancouver, B.C., 153 p.

Schmid, J.M.; Mata, S.A.; McCambridge, W.F. 1985. Natural falling of beetle-killed ponderosa pine. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Research Note RM-454, 3 p.